



The Clear Skies Act of 2003

Kentucky and Clear Skies



Highlights of Clear Skies in Kentucky

- **Kentucky sources would reduce emissions of SO₂ by 51%, NO_x by 74%, and mercury by 68% by 2020 due to Clear Skies.**
- **By 2020, Kentucky would receive approximately \$3.6 billion in annual health benefits from Clear Skies (an alternative estimate projects \$640 million in health benefits in Kentucky). This includes 500 fewer premature deaths (300 under the alternative estimate) and 900 fewer hospitalizations/emergency room visits for asthma.**
- **In addition, Kentucky would receive environmental benefits including reductions in acid deposition that will benefit forests and streams in the Appalachian Mountains and visibility improvements.**
- **Clear Skies does not significantly impact electricity prices. With or without Clear Skies, electricity prices in the electricity supply region that includes Kentucky are expected to remain below the national average.**

Clear Skies: An Innovative Approach to Improving Human Health and the Environment

Why Clear Skies?

- **Air quality has improved, but serious concerns persist**
 - Kentucky citizens suffer ill effects from air pollution, including asthma attacks and premature death
- **Electricity generation sector remains a major emissions source**
 - Very cost-effective to control the power sector, relative to other sources
 - Sources are concerned about upcoming complex and burdensome regulations

Advantages of the Clear Skies Approach

- **Guarantees significant nationwide emissions reductions – beginning years before full implementation**
 - Kentucky sources would substantially reduce emissions of SO₂, NO_x, and mercury
 - Delivers dramatic progress towards achievement of critical health and environmental goals
- **Uses proven, market-based flexible approach with incentives for innovation**
 - Recognizes environmental needs as well as industry constraints, allowing industry to better manage its operations and finances while lowering risks to the public
 - Sources are projected to install pollution controls to enable continued reliance on coal
- **Increases certainty across the board for industry, regulators, and consumers**

Under Current Clean Air Act Power Plants Would Face a Complex Set of Requirements

NSR Permits for new sources & modifications that increase emissions

Ozone

1-hr Serious Area Attainment Date

Designate areas for 8-hr Ozone NAAQS

1-hr Severe Area Attainment Date

Marginal 8-hr Ozone NAAQS Attainment Date

8-hr Ozone Attainment Demonstration SIPs due

Assess Effectiveness of Regional Ozone Strategies

Moderate 8-hr Ozone NAAQS Attainment Date

Note: Dotted lines indicate a range of possible dates.

¹ Further action on ozone would be considered based on the 2007 assessment.

² The SIP-submittal and attainment dates are keyed off the date of designation; for example, if PM or ozone are designated in 2004, the first attainment date is 2009

EPA is required to update the new source performance standards (NSPS) for boilers and turbines every 8 years

Serious 8-hr Ozone NAAQS attainment Date

Possible Regional NO_x Reductions ? (SIP call II)¹

NO_x SIP Call Reductions

NO_x SIPs Due

OTC NO_x Trading

Phase II Acid Rain Compliance

Mercury Determination

Proposed Utility MACT

Final Utility MACT

Interstate Transport Rule to Address SO₂/ NO_x Emissions for Fine PM NAAQS and Regional Haze

New Fine PM NAAQS Implementation Plans

Regional Haze SIPs due

Compliance with Utility MACT

Latest attainment date for Fine PM NAAQS ³

Compliance for BART Sources

Compliance for BART sources under the Trading Program

Second Regional Haze SIPs due

Acid Rain, PM_{2.5}, Haze, Toxics

In developing the timeline of current CAA requirements, it was necessary for EPA to make assumptions about rulemakings that have not been completed or, in some case, not even started. EPA's rulemakings will be conducted through the usual notice-and-comment process, and the conclusions may vary from these assumptions.

Clear Skies Sets a Firm Timeline for Emission Reductions

2004: The NO_x SIP call (summertime NO_x cap in 19 Eastern States + D.C.)

2004

The existing Title IV SO₂ cap-and-trade program provides an incentive and a mechanism to begin reductions upon enactment of Clear Skies years before regulatory action under the current Act.

2008: Clear Skies NO_x Phase I (2.1 million ton annual cap assigned to two Zones with trading programs)

2008

2010: Clear Skies Hg Phase I (26 ton annual cap with a national trading program)

2010

2010: SO₂ Phase I (4.5 million ton annual cap with a national trading program)

2018: Clear Skies NO_x Phase II (1.7 million ton annual cap assigned to two Zones with trading programs)

2018

2018: Clear Skies Hg Phase II (15 ton annual cap with a national trading program)

2018: Clear Skies SO₂ Phase II (3.0 million ton annual cap with a national trading program)

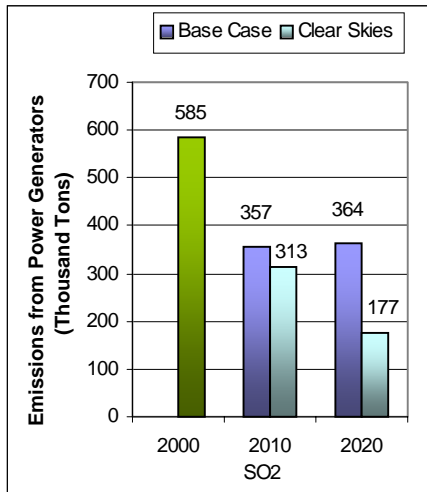
Emissions in Kentucky under Clear Skies

Emissions in Kentucky (2020) would be significantly reduced from 2000 levels:

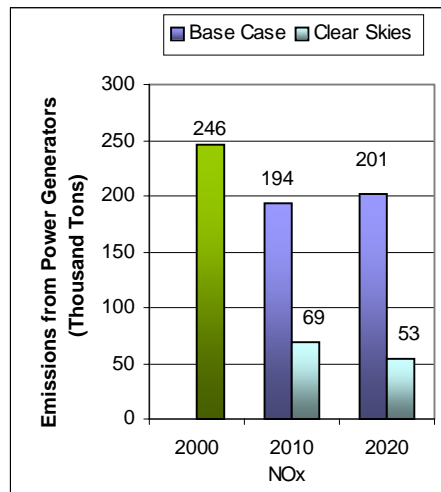
- 70% reduction in SO₂ emissions
- 78% reduction in NO_x emissions
- 76% reduction in mercury emissions

**Emissions: Current (2000) and Existing Clean Air Act Regulations (base case*)
vs. Clear Skies in Kentucky in 2010 and 2020**

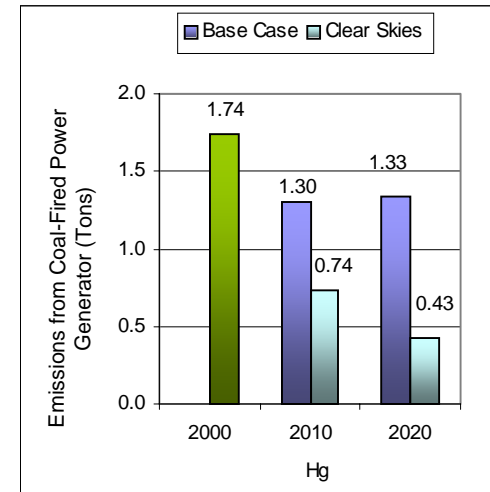
Sulfur dioxide



Nitrogen oxides



Mercury



Note: The base case using IPM includes Title IV, the NO_x SIP Call, NSR settlements, and state-specific caps in CT, MA, MO, NC, NH, TX, and WI. It does not include mercury MACT in 2007 or any other potential future regulations to implement the current ambient air quality standards or other parts of the Clean Air Act. Base case emissions in 2020 will likely be lower due to state and federal regulatory actions that have not yet been promulgated.

Clear Skies Health Benefits in Kentucky

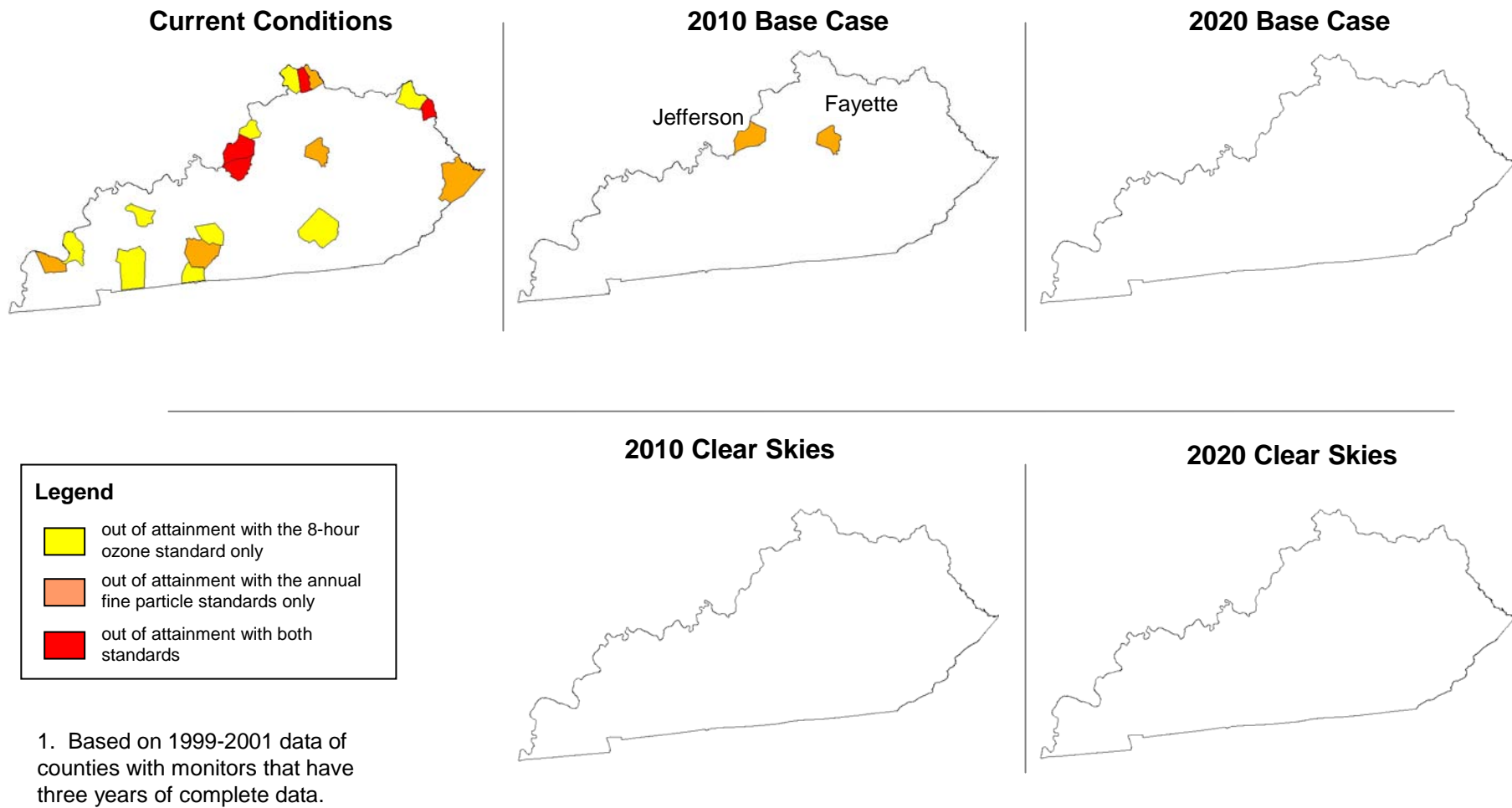
Improve Public Health

- **Reduced ozone and fine particle exposure** by 2020 would result in public health benefits of:
 - approximately 500 fewer premature deaths each year¹
 - approximately 300 fewer cases of chronic bronchitis each year
 - approximately 600 fewer non-fatal heart attacks each year
 - approximately 900 fewer hospital and emergency room visits each year
 - approximately 49,000 fewer days workers are out sick due to respiratory symptoms each year
 - approximately 6,400 fewer school absences each year
- **Reduced mercury emissions** would reduce exposure to mercury through consumption of contaminated fish, resulting in additional, unquantified benefits for those who eat fish from Kentucky's rivers and lakes.

By 2020, Kentucky would receive approximately \$3.6 billion in annual health benefits from reductions in fine particle and ozone concentrations alone due to Clear Skies.¹

1. An alternative methodology for calculating health-related benefits projects approximately 300 premature deaths prevented and \$640 million in health benefits each year in Kentucky by 2020.

Counties Projected to Remain Out of Attainment with the PM_{2.5} and Ozone Standards in Kentucky¹



Note: The base case includes Title IV, the NO_x SIP Call, the Tier II, Heavy-Duty Diesel, and Nonroad Diesel rules, final NSR settlements as of early spring 2003, and state-specific caps in CT, MA, MO, NC, NH, TX, and WI. It does not include mercury MACT or any other potential future regulations to implement the current ambient air quality standards or other part of the Clean Air Act.

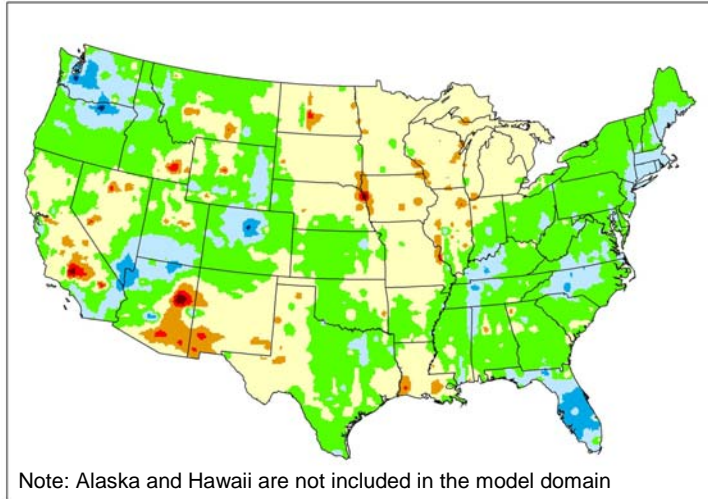
Clear Skies Would Help Kentucky Meet Air Quality Standards

- Currently there are 9 counties exceeding the annual fine particle standards and 13 counties exceeding the 8-hour ozone standard.
 - All of these counties are expected to be brought into attainment with the fine particle standards under existing programs by 2020.
 - All of these counties are expected to be brought into attainment with the ozone standard under existing programs by 2010.
- **Clear Skies would significantly improve air quality in Kentucky** further and more quickly than what is expected from existing programs.
 - By 2010, Clear Skies would bring the 2 remaining non-attainment counties (Jefferson and Fayette--population approximately 1 million) into attainment with the annual fine particle standards.
- In addition, Clear Skies would reduce ozone and fine particle concentrations in counties attaining the standards throughout the state.

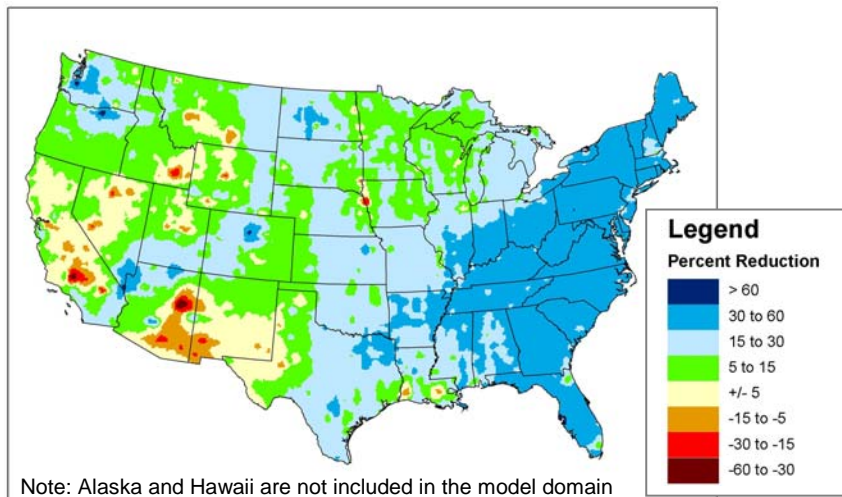
Note: Based on 1999-2001 data of counties with monitors that have three years of complete data.

Clear Skies Environmental Benefits in Kentucky

Projected Changes in Sulfur Deposition with the Base Case in 2020 Compared to 2001



Projected Changes in Sulfur Deposition with Clear Skies and the Base Case in 2020 Compared to 2001



Clear Skies Would Provide Substantial Environmental Benefits in Kentucky

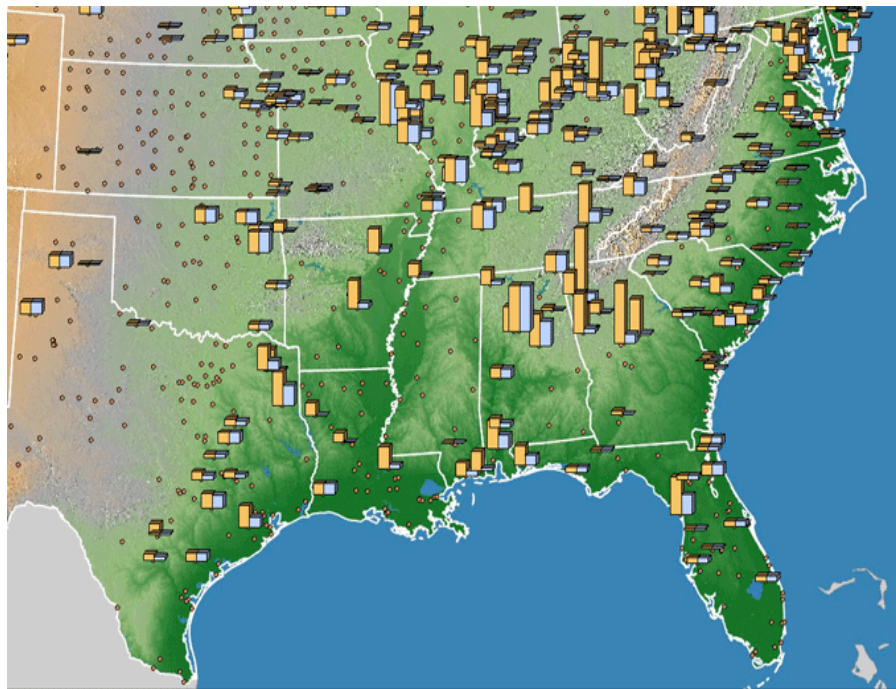
In comparison to existing programs,

- **Visibility would improve** perceptibly.
 - The value of this benefit for Kentucky residents who visit America's National Parks and Wilderness Areas is \$43 million.
- **Sulfur deposition, a primary cause of acid rain, would decrease** by 30-60% across the eastern half of Kentucky, speeding recovery of acid-sensitive Appalachian mountain streams.
- **Nitrogen deposition, another significant contributor to acid rain, as well as a cause of damage in nitrogen-sensitive forests, would decrease** by up to 20%.
- **Mercury deposition would decrease** by up to 15% in most of the state and by up to 60% in areas along the Ohio border.*

* These results are based on modeling the Clear Skies mercury cap without triggering the safety valve.

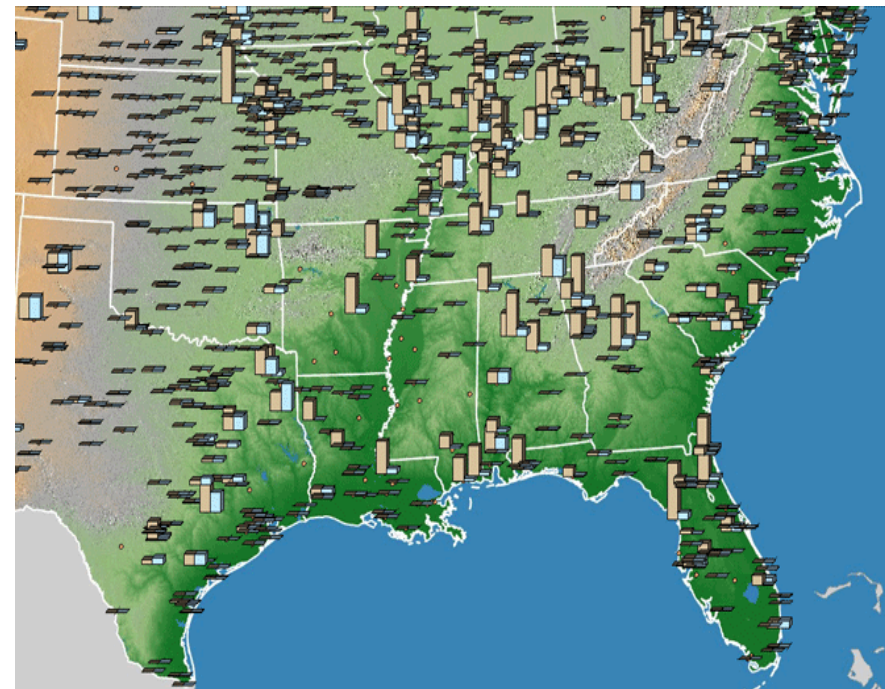
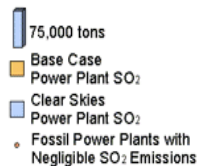
SO₂ and NO_x Emissions Reductions under Clear Skies

Emissions in Kentucky and surrounding states would decrease considerably. These emission reductions would make it much easier for Kentucky to maintain compliance with the national air quality standards.



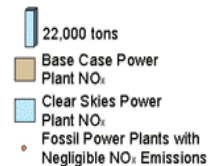
Projected SO₂ Emissions from Power Plants
with the Base Case and Clear Skies (2020)

South



Projected NO_x Emissions from Power Plants
with the Base Case and Clear Skies (2020)

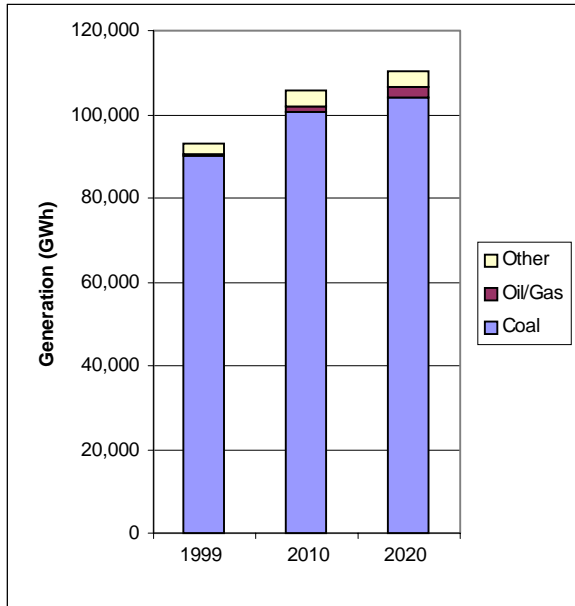
South



Note: The base case in IPM includes Title IV, the NO_x SIP Call, NSR settlements, and state-specific caps in CT, MA, MO, NC, NH, TX, and WI. It does not include mercury MACT in 2007 or any other potential future regulations to implement the current ambient air quality standards or other parts of the Clean Air Act. Base case emissions in 2020 will likely be lower due to state and federal regulatory actions that have not yet been promulgated. Emissions projected for new units in 2020 are not reflected.

Electricity Generation in Kentucky under Clear Skies

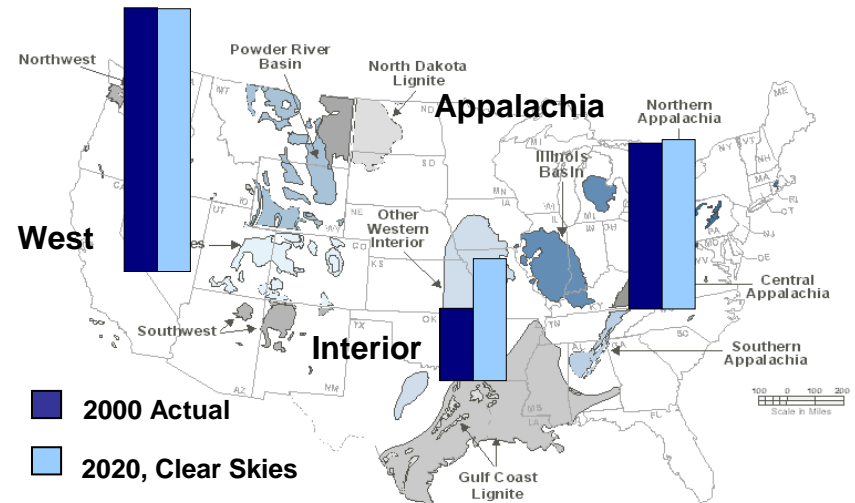
Current and Projected Generation by Fuel Type in Kentucky under Clear Skies (GWh)



- **Kentucky's electricity growth is projected to be met by increases in gas-fired and coal-fired generation. Clear Skies does not significantly alter this projection.**
 - Electricity from coal-fired generation will increase by 16% from 1999 to 2020.

- **Kentucky's sources are projected to reduce their emissions through the installation of emission controls, rather than through a switch from coal to natural gas.**
 - In 2010, 80% of Kentucky's coal-fired generation is projected to come from units with advanced SO₂ and/or NO_x control equipment that also substantially reduce mercury emissions; in 2020, the percentage is projected to increase to 89%.
 - No coal-fired units in Kentucky are projected to be removed from operation as a result of Clear Skies.

Current and Projected Coal Production for Electricity Generation



Emission Controls in Kentucky under Clear Skies

- **Under Clear Skies by 2020...**

- 21% of coal-fired capacity would install SCR or SNCR
- 32% would install scrubbers

- **The major generation companies in Kentucky include:**

- Kentucky Utilities Company
- Louisville Gas & Electric Co.
- East Kentucky Power Cooperative
- Tennessee Valley Authority

- **Total coal-fired capacity in Kentucky is projected to be 14,179 MW in 2010**

Units in Kentucky Projected to be Retrofitted due to Clear Skies by 2020

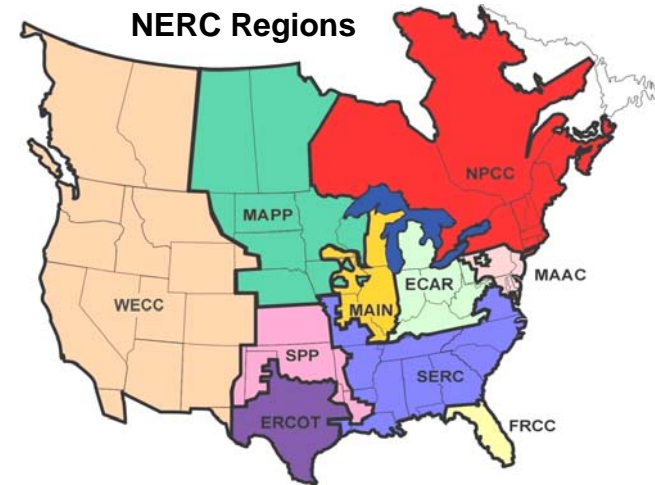
Plant Name	Unit ID	Technology
BIG SANDY	BSU1	Scrubber/ SCR
BIG SANDY	BSU2	Scrubber*
COLEMAN	C1	Scrubber/ SCR
COLEMAN	C2	Scrubber/ SCR
COLEMAN	C3	Scrubber/ SCR
COOPER	2	Scrubber
E W BROWN	2	Scrubber/ SCR
E W BROWN	3	Scrubber/ SCR
GHENT	2	Scrubber
GHENT	3	Scrubber
GHENT	4	Scrubber
H L SPURLOCK	1	Scrubber
H L SPURLOCK	2	Scrubber*
CANE RUN	6	SCR*
E W BROWN	1	SCR
ELMER SMITH	2	SCR*
HMP&L STATION 2	H1	SCR*
MILL CREEK	1	SCR*
R D GREEN	G1	SCR*
R D GREEN	G2	SCR*
SHAWNEE	10	SCR
DALE	3	SNCR
DALE	4	SNCR

* Retrofit was installed under Clear Skies by 2010

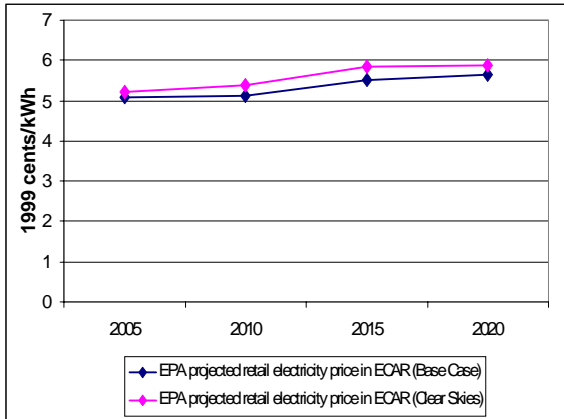
Note: Retrofits and total coal-fired capacity apply to coal units greater than 25 MW.

Electricity Prices in Kentucky under Clear Skies

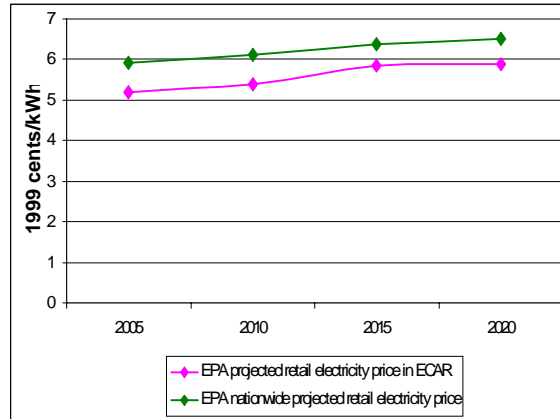
- With or without Clear Skies, retail prices in the North American Electric Reliability Council (NERC) ECAR region (the electricity supply region that contains Kentucky) are projected to increase between 2005 and 2020.
- With Clear Skies, retail prices are projected to be approximately 2.4 – 6.4% higher between 2005 and 2020 than in the absence of the legislation.



Projected Retail Electricity Prices in Kentucky under the Base Case and Clear Skies (2005-2020)



Projected National Retail Electricity Prices and Prices in Kentucky under Clear Skies (2005-2020)



In 2000, the average retail electricity price in Kentucky was approximately 4.1 cents/kWh, which was below the average *national* retail price of approximately 6.7 cents/kWh.

Costs and Benefits in Kentucky under Clear Skies

Benefits Outweigh the Costs

- **In Kentucky, Clear Skies is projected to cost approximately \$292 million annually by 2020 while providing health benefits totaling approximately \$3.6 billion annually.**
- **The increases in production costs under Clear Skies represent only a small percentage of total retail electricity sales revenue in Kentucky.**
 - Retail electricity sales revenue in Kentucky was \$3.2 billion in 2000.
 - Adjusting these sales revenues by the same growth rate used for the modeling of costs would result in revenues of over \$4.9 billion annually in 2020.
- **Nationwide, the projected annual costs of Clear Skies (in \$1999) are \$4.3 billion in 2010 and \$6.3 billion in 2020; the nationwide benefits of Clear Skies are expected to be over \$113 billion annually by 2020.**
 - An alternate estimate projects annual health benefits totaling \$23 billion.

Clear Skies....

- **Guarantees significant emissions reductions – beginning years before full implementation**
- **Uses a proven and flexible market-based approach with incentives for innovation**
- **Increases certainty across the board for industry, regulators, and consumers**

Note: Costs include capital costs, fuel, and other operation and maintenance costs (both fixed and variable) associated with the achievement of the emissions caps in the legislation (for example, the installation and operation of pollution controls). These state-level production costs are estimates; they do not account for the costs associated with the transfer of electricity across regions, nor the costs or savings that could be associated with allowance movement between sources.

Notes on EPA's Analysis

- The information presented in this analysis reflects EPA's modeling of the Clear Skies Act of 2003.
 - EPA has updated this information to reflect modifications:
 - Changes included in the Clear Skies Act of 2003.
 - Revisions to the Base Case to reflect newly promulgated rules at the state and federal level since the initial analysis was undertaken.
 - The Clear Skies modeling results presented include the safety valve feature
 - This analysis compares new programs to a Base Case (Existing Control Programs), which is typical when calculating costs and benefits of Agency rulemakings.
 - The Base Case reflects implementation of current control programs only:
 - Does not include yet-to-be developed regulations such as those to implement the National Ambient Air Quality Standards.
 - The EPA Base Case for power sector modeling includes:
 - Title IV, the NO_x SIP Call, NSR settlements, and state-specific caps in Connecticut, Massachusetts, Missouri, New Hampshire, Kentucky, Texas, and Wisconsin finalized before March 2003.
 - For air quality modeling, the Base Case also includes federal and state control programs, as well as the Tier II, Heavy Duty Diesel, and Non-Road Diesel rules.
- **For more information regarding the Clear Skies Act, please visit the EPA website:**

(<http://www.epa.gov/clearskies>)

